

## **BOAT ACCESS STAIRWAY**

### **BACKGROUND OF THE INVENTION**

[0001] In order to load and unload manifest items from a boat it is customary to provide a gangplank for passengers and small cargo items. Changing water levels give rise to the need to provide adjustable loading and unloading ramps. Ramps are not only necessary for ocean going boats but are also needed for loading and unloading manifest items of barges. Changes in river water levels present problems similar to changing tides. Although a flat ramp may be satisfactory for loading and unloading operations if the slope of the ramp is not steep, the changing tides and river levels give rise to a need for a safer conveyance surface with steps being generally preferred. In providing a pier mounted access ramp to a barge there is a need to maintain the same orientation of the barge boarding platform regardless of the slewed condition of the ramp. In other words it is desirable for the exit from the barge boarding platform to face the same direction relative to the barge regardless of the slewed position of the ramp.

### **BRIEF SUMMARY OF THE INVENTION**

[0002] The boat access stairway of this invention provides a versatile conveyance for transferring the manifest items to and from a boat such as a barge. A landing is provided for attachment to a pier which includes a first part fixed to the pier and a second part pivoted to the first part on a vertical axis. A ramp is pivotally connected to the second part of the landing on a horizontal pivot axis. These two pivot connections permit raising and lowering of the ramp and slewing of the ramp. The boat access stairway includes power apparatus for slewing the ramp and for raising and lowering the ramp. Additionally, the boat access stairway includes a platform at the free end of the ramp which can be set down on a boat. The platform has a first segment pivotally connected to the outer end of the ramp on a horizontal axis and a second

segment pivotally connected to the first segment on a vertical axis. The second segment includes a floor. Two laterally spaced upright spars are pivotally supported on the stationary part of the landing on vertical axes and two laterally spaced upright spars are pivotally supported on the second segment of the platform. Upper and lower links are pivotally connected at their corresponding opposite ends to the spars on the landing and the platform and when the ramp is slewed the platform retains the same general orientation relative to the boat. The access stairway may be slewed to compensate for the distance between the pier and the boat, but in doing so the exit from the platform onto the boat maintains its direction orientation.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0003] One embodiment of the invention is shown in the drawings, in which:

Figure 1A is a top view of the boat access stairway with certain parts removed for illustration purposes;

Figure 1B is a top view of the boat access stairway similar to Figure 1 but with the stairway slewed;

Figure 2 is a side view of the boat access stairway adjusted for access to a boat deck substantially lower than the pier;

Figure 3 is a side view of the boat access stairway with parts removed for illustration purposes and showing its boat access position when the boat deck is about the same elevation as the pier;

Figure 4 shows the boat access stairway in a raised position;

Figure 5 is a section taken on the line V-V in Figure 3;

Figure 6 is a section taken on the line VI-VI in Figure 5;

Figure 7 is a section taken on the line VII-VII in Figure 1A,

Figure 8 is a section taken on the line VIII-VIII in Figure 2, and

Figure 9 is a side view of the boat access stairway with parts removed for illustration purposes.

## **DETAILED DESCRIPTION OF THE INVENTION**

[0004] The conveyance illustrated in the drawings is a boat access stairway 11 designed for attachment to a pier 14.. Figure 1A is a top view of the boat access stairway 11 having a landing 12 which has a first part 13 rigidly secured to the pier 14. The landing 12 also includes a second part 16 pivotally connected to the first part on a vertical pivot axis 17. The stationary first part 13 and the pivotable second part 16 of the landing 12 have floors 18, 19 on the same level with confronting complimentary semi-circular edges.

[0005] Referring also to Figures 5 and 6, the first part 13 of the landing 12 includes a sleeve bearing 21 supported by struts 22, 23 and the second part 16 of the landing includes a vertical pivot tube 24 pivotally supported in the sleeve bearing 21 for pivotal movement about the vertical axis 17. Pivotal movement of the second part 16 of landing relative to its first part 13 is effected by extension and contraction of a linear fluid power actuator 26 having of a cylinder 27 pivotally connected to a cylindrical support member 28 on the first part 13 and a piston having a rod 29 pivotally connected to a lever arm 31 nonrotatably fastened to the pivot tube 24.

[0006] As shown in Figures 1A and 1B the boat access stairway 11 includes an elongated ramp 36 having one of its longitudinal ends pivotally connected to the second part 16 of the landing 12 on a horizontal pivot axis 37 which is transverse to the direction of elongation of the ramp 36. The other longitudinal end of the ramp 36 is pivotally connected to a first segment 41 of a platform 42 on a second horizontal pivot axis 43 which is parallel to the axis 37. The ramp 36 is a stairway with self leveling steps 46 pivotally supported on and between a pair of parallel

stringers 47, 48. Corresponding ends of the stringers 47, 48 are pivotally connected on the axis 37 to the second part 16 of the landing 12 and on the axis 43 to the first segment 41 of the platform 42.

[0007] As shown in Figures 3, 8 and 9, the second part 16 of the landing 12 includes a pair of laterally spaced vertically extending support plates 51, 52 to which the stair stringers 47, 48 are pivotally connected, respectively. A pair of laterally spaced vertical stand posts 53, 54 are rigidly secured at their lower ends to the second part 16 of the landing 12. As shown in Figures 2, 3, 4, 7 and 9 a pair of laterally spaced vertically extending rigid posts 56, 57 are rigidly secured to the first segment 41 of the platform 42. A pair of laterally spaced parallel rails 58, 59 have corresponding opposite ends pivotally connected to the upper ends of stand posts 53, 54 and the rigid posts 56, 57 on parallel horizontal axes 61, 62. Axes 37, 43, 61, 62 define corners of a parallelogram. Intermediate vertical posts 63, 64 are rigidly connected at their lower ends to a longitudinally spaced pair of steps 46 and are pivotally connected at their upper ends to the rail 58. Intermediate vertical posts 66, 67 are rigidly connected at their lower ends to the same longitudinally spaced pair of steps 46 and are pivotally connected at their upper ends to the rail 59. As shown in Figure 9, stair leveling links 71, 72, 73 serve to pivot the steps 46 to maintain their treads horizontal when the ramp 36 is pivoted up or down relative to the pier 14.

[0008] The platform 42 includes a second segment 76 pivotally connected to the first segment 41 on a vertical pivot axis 81. As shown in Figure 7 the second segment 76 includes a floor 77 and a pivot sleeve 78 pivotally supporting a tube component 79 of the first segment 41 inserted in and in cylindrical surface bearing relation with the interior of the sleeve 78. Thus the first and second segments 41, 76 of the platform 42 are connected for relative pivotal movement about the vertical pivot axis 81. The second segment 76 includes a pair of laterally spaced

upstanding structures 86, 87 and a safety railing 89 around the floor 77 except for the arc cut out portion of the floor mating with a semi circular part of the floor 41 and except for a gateway 88. An inward opening gate 91 is provided at the gateway 88.

[0009] Referring to Figure 8, the landing 12 includes a pair of laterally spaced vertical walls 92, 93 to which the upper and lower ends of a pair of laterally spaced parallel vertical spars 94, 96 are pivotally connected on parallel vertical axes 101, 102. In a similar manner a pair of laterally spaced parallel vertical spars 103, 104 are pivotally connected at their upper and lower ends to the upstanding structures 86, 87 of the second segment 76 of the platform 42 for pivotal movement about a pair of vertical axes 106, 107. As shown in Figure 1A the vertical axes 101, 102 and 17 lie in a common vertical plane 111 and the axes 106, 107, 81 lie in a common vertical plane 112. The pivot axes 101, 102, 106, 107 define the corners of a parallelogram. Axes 101 and 102 are equal distances from axis 17 and axes 106, 107 are equal distances from axis 81. This configuration permits slewing of the stairway 36 as illustrated in Figure 1B.

[0010] A parallel lift linkage arrangement is provided for raising and lowering the gateway 42 and for maintaining the orientation of the platform 42 when the stairway 36 is slewed. The lift linkage includes a pair of laterally spaced parallel upper links 116, 117 having first corresponding ends pivotally connected to the upper ends of the first pair of upright spars 94, 96 on parallel horizontal axes 118, 119, respectively, and having second corresponding ends pivotally connected to the upper ends of the second upright spars 103, 104 on parallel horizontal axes 121, 122, respectively. The lift linkage also includes a pair of laterally spaced parallel lower links 126, 127 having first corresponding ends pivotally connected to the lower ends of the first upright spars 94, 96 on horizontal axes 128, 129, respectively, and second corresponding ends pivotally connected on parallel horizontal axes 131, 132 to the lower ends of the second

pair of upright spars 103, 104, respectively. The axes 118, 121, 128, 131 define the corners of a parallelogram and the axes 119, 122, 129, 132 define the corners of a parallelogram. The links 116, 117, 126, 127 include braces 151, 152, 153, 154 along their laterally outer sides.

[0011] The stairway 36 and platform 42 are raised and lowered by a pair of linear actuators in the form of fluid rams 136, 137 interconnected between the first pair of upright spars 94, 94 and the lower links 126, 127.

[0012] The herein described and illustrated boat access stairway can be secured to a pier to afford access to a boat or barge 144 adjacent the pier. Figure 2 shows the stairway 36 sloping downward at a 40 degree angle 145 and Figure 4 shows the stairway sloping upward at an angle 146 of 30 degrees. The desired elevation of the platform 42 will depend on the water level and the elevation of the barge deck on which the platform 42 is set down. The pivoting of the upright spars 94, 96, 103, 104 on vertical axes and the pivot connections between parts and segments of the landing and platform, respectively, permits the stairway to be slewed in either direction. As shown in Figure 1B the stairway 36 is slewed by an angle 147 of 20 degrees. It is desirable that the gateway 88 of the platform 42 face the same direction regardless of the slewed position of the stairway. This orientation maintenance is provided by the parallel raising links 116, 117, 126 and 127 interconnected between the landing 12 and the platform 42.